

Long-term effects of an educational intervention on self-medication and appropriate drug use in single-sex secondary public schools, Quito, Ecuador

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What is already known about this subject

- Self-medication is extensively practised in both developed and less-developed countries, sometimes inappropriately.
- Educational intervention in secondary schools has been proven to be useful.
- Most educational interventions in adolescent populations have focused on the reduction of addictive substance abuse.

What this study adds

- Educational intervention can improve knowledge about self-medication and reduce misconceptions about diarrhoea, common cold and vitamins in an adolescent population.
- A specific lecture followed by small working-group seminars produces better results than a general lecture alone in terms of 'knowledge' and 'attitude'.
- The positive effects of the intervention are detectable even 1 year later. Yearly reinforcing interventions while in secondary school would allow long-lasting effects.

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Aim

Improving knowledge about rational drug use at an early age may be a good way to increase the population's awareness of health, medicines and self-medication. We set out to evaluate the short- and long-term effects of an educational intervention to promote rational drug use and self-medication in secondary school students.

Methods

A non-randomized, controlled clinical trial. The participants were 367 female students (10–13 years old) from two secondary public schools of the metropolitan district of Quito (Ecuador). The educational campaign had two components [a specific lecture (intervention and control schools) and subsequent small working group seminars (intervention school)] providing short and clear messages of five topics related to rational drug use. The main outcome measures were an increase in 'knowledge' short term (1 month) and long term (up to 1 year) after intervention and the relative risk (RR) reduction in misconceptions or wrong ideas about medicine use.

Results

The intervention group showed a significant increase in knowledge both short and long term and in comparison with the control group, mainly regarding oral rehydration salts preparation (+59.4%; $P < 0.001$), lack of multivitamin energizer action (+57.4%; $P < 0.001$), healthy growth effects (+53.3%; $P < 0.001$) and the perception that medicines' promotional activities do not teach how to take care of health (+54.0%; $P < 0.001$). A RR reduction in misconceptions about drugs was found short term and long term. The intervention group was less predisposed to consume antidiarrhoeals [RR = 0.75, 95% confidence interval (CI) 0.62, 0.92], cough suppressants (0.44, 95% CI 0.35, 0.55) and other medicines for the common cold (0.56, 95% CI 0.45, 0.70). Misconceptions concerning the benefits of multivitamin preparations were reduced in 73%; additionally, the intervention group showed a decrease in their consumption (43.9% basal; 25.3% short term and 25.6% long term; $P < 0.001$).

Conclusion

It is possible to achieve a favourable modification of attitudes to appropriate use of medicines in a teenage population and this modification lasts at least 1 year. Continuous reinforcing interventions would allow better and long-lasting effects and could help to fill the gap in health education of the general population.

Introduction

Self-medication affects both developed and less-developed countries. Its extent in Latin America has been highlighted by several studies [1]. There may be some positive aspects of self-medication when performed according to rational criteria [2]. Nevertheless, in developing countries self-medication usually leads to inadequate drug utilization patterns [3] and is especially worrying when it involves specific diseases (e.g. diarrhoea or the common cold) or prescription drugs such as antibiotics. In addition, promotional advertising of over-the-counter drugs (OTCs) in the mass media probably changes people's knowledge of and attitudes to medicines (not only OTCs but also prescription drugs), thus increasing drug consumption as an easy way to take care of health problems [4]. This response contributes to the increasing medicalization of society and irrational drug use [5].

There is a great deal of literature available on school-based drug education activities designed to reduce the use of addictive substances [6]. Some of these interventions showed favourable outcomes [6–8]. Improving knowledge about rational drug use at an early age may be a good way of increasing the population's knowledge concerning health, medicines and self-medication. Nevertheless, the effects of educational intervention to promote appropriate drug use has not previously been well studied in young populations [9, 10]. It may be useful to analyse the effectiveness of an educational intervention focusing on self-medication and the use of medicines among adolescents, a sensitive age in which people become aware of their bodies, and some future attitudes can be shaped in the context of the learning process.

The present study was carried out in order to evaluate the short- and long-term effects of an educational intervention to promote rational drug use and self-medication in secondary school students.

Population and methods

The study was designed as a non-randomized, controlled clinical trial in two secondary public schools of the metropolitan district of Quito (Ecuador): the Eugenio Espejo (EE) school, where an educational intervention was carried out, and the Simón Bolívar (SB) school, which served as the control. This school allocation was made by a simple random method. The total duration of the trial was 16 months, from December 2002 (basal measurement and intervention) to April 2004 (long-term measurement of the effects of the intervention); a short-term measure was carried out 1 month after the intervention (January 2003). The Bioethics Committee of the

Central University of Ecuador approved the study protocol. In addition, the study activities were performed with the permission of each school authority.

All eighth degree students between 10 and 13 years old, attending the school at the time of the first visit (basal measurement), that voluntarily accepted to complete an anonymous self-reported questionnaire were included. Those students who were absent, did not participate in the educational intervention or were lost at follow-up visits were excluded. In addition, incomplete questionnaires (>30% of items not answered) were also excluded.

Educational intervention

The intervention performed at the EE school consisted of a short educational campaign (one scholar day) with two phases: a specific conference addressing all the students, and subsequent seminars for small working groups (≤ 10 students per group). The conference was accompanied by audiovisual material written in a simple language. Five topics were considered: (i) problems about self-medication, (ii) the common cold, (iii) diarrhoea, (iv) vitamins, and (v) promotional drug activities. Basic concepts were reviewed, focusing on irrational drug use and suggesting the avoidance of some drugs. The contents were based on concepts previously reviewed by other authors [11–13].

The small working group activities were assisted by a team of previously trained medical students. Their objectives were to clarify some questions highlighted during the specific conference and to repeat all the main messages. Additionally, the topics discussed included the risks of inappropriate consumption of antidiarrhoeal and cough suppressants, the inconvenience of self-medication practices, the false benefit of consuming multivitamin preparations, the relevance of using oral rehydration salts (ORS) and its practical preparation. Finally, there was active discussion of these topics.

The intervention was conducted with a marketing strategy called 'demarketing', which involves activities to promote reduction in the consumption of a specific product [14]. It consisted of giving information opposite to that of drug advertisements directed at consumers (i.e. 'cough suppressants could worsen the disease', 'multivitamins can not make you a better student', etc.). Moreover, all the main messages had been prepared previously using some rules of the same marketing psychology and applied the principles proposed to elaborate messages addressed to an adolescent public [15, 16]. These messages were accompanied by short and clear ideas transmitted in a simple, easy and understandable way (i.e. 'cough is a defensive mechanism to

eliminate respiratory secretions', 'multivitamin preparations are not necessary: a balanced diet is better', 'medicines' advertisements want your money, not your health').

In contrast, the control group (SB school) received only a general lecture on basic health topics (i.e. messages such as 'hand wash to prevent disease transmission', 'avoid fatty diets and make exercise to be healthy').

In both secondary schools all the programmed curricular activities remained normal and unchanged during the follow-up period of the study.

Measurements and outcomes

All the measurements (basal, short and long term) were performed at the same time in both groups during a normal school day. An anonymous self-reported questionnaire was used. Up to 22 sentences (expressed as affirmative assertions) had to be answered as 'right' or 'wrong'. Affirmative sentences were used to reduce the risk of 'yes' responders bias [17], thus ensuring that only those students who really knew the right answer would choose the right option. Items assessed were the same each time, but with a varied questionnaire structure.

The main outcome was 'knowledge' and the primary end-point was the number of right/wrong answers 1 month (short term) and 1 year (long term) after educational intervention. The secondary end-point was the relative risk (RR) reduction in misconceptions concerning drug use.

Statistical analysis

To test the hypothesis that educational intervention would lead to a significant improvement in knowledge in the intervention group, the number of subjects in each group was calculated in order to detect an absolute difference of 0.20 if there were at least 30% of right basal answers [80% power and 95% confidence interval (CI)]. A minimum of 93 students per group were estimated necessary.

The efficacy of the intervention was defined as the statistically significant percent increment/change of knowledge. Significance level ($P < 0.05$) was estimated by proportional comparison test and comparisons were made for short-term vs. basal and long-term vs. basal measures.

A RR and its 95% CI were also calculated to estimate the long-term persistence of misconceptions about drug use (i.e. false benefits of multivitamins, the need to take medicines, antibiotics, cough suppressants or injections for the common cold).

Results

Up to 367 students [intervention group ($n = 166$) and control group ($n = 201$)] were recruited and participated in the basal and short-term measurements. Sixteen subjects were lost or withdrawn during follow-up (Figure 1). Basal characteristics were similar between study groups (Table 1).

Basal knowledge and attitudes of students

Basal knowledge was also similar between both groups (Table 2). Only the perception of the common cold as a nonserious disease was higher in the control group ($P < 0.05$). Most of the students thought that taking a medicine or receiving an injection was useful in the common cold, only 28.8% (95% CI 24.1, 33.9) had the perception that cough was a defensive mechanism, and 85% said that cough suppressants were necessary.

Less than a half of the students knew that diarrhoea was a self-limited defensive response. Only 35.0% (95% CI 30.1, 40.2) was predisposed not to take antidiarrhoeals. Although almost 80% knew the relevance of avoiding dehydration, they did not know about ORS and their preparation.

In both groups vitamins were frequently described as 'drugs' and most considered that multivitamin preparations help learning, foster healthy growth and are energizers.

Frequently students thought that promotional activities on medicines can teach people how to take care of their own health. Perceptions about benefits and safety of medicines showed similar frequencies in both groups (Table 2).

Short- and long-term effects of educational intervention

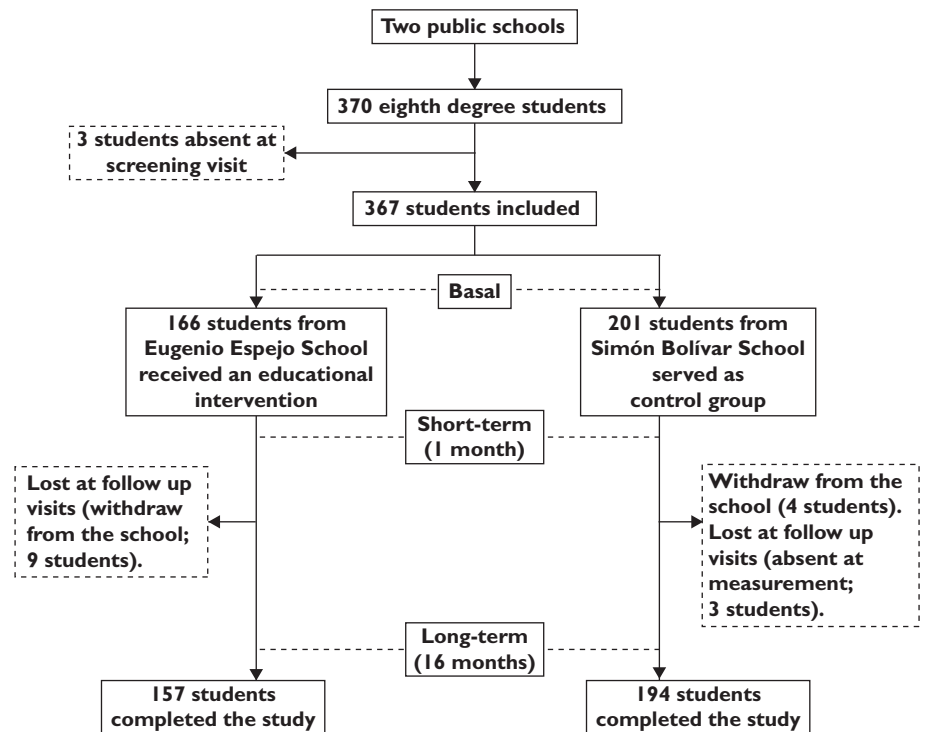
In the intervention group a significant increase in knowledge was detected both short term and long term and in comparison with the control group (Table 2). Frequently, right answers doubled or tripled in comparison with the basal status.

Short term, main increases were knowledge about ORS preparation (+59.4%; $P < 0.001$), lack of energizer action by multivitamins (+57.4%; $P < 0.001$) or healthy growth effects (+53.3%; $P < 0.001$) and the perception that medicines' promotional activities do not teach how to take care of health (+54.0%; $P < 0.001$).

In the control group basal and follow-up findings were similar. There was a slight (nonsignificant) increase in the number of some right answers, except for the items about unnecessary use of cough suppressants (from 12.6% to 20.6%; $P < 0.05$) and the quality of medicines' promotional information (from 21.5% to 30.5%;

Figure 1

Flowchart of the study

**Table 1**

Basal characteristics of the study groups

Items	Intervention group (n = 166)	Control group (n = 201)
<i>School characteristics</i>		
Educational level	Secondary	Secondary
Administration	Public	Public
School time	Afternoon	Afternoon
Gender	Female	Female
City location	Central district	Central district
Working status	Active	Active
Drug use themes in curriculum	None	None
Total number of students (eighth degree)	166	500
<i>Student characteristics</i>		
Age, mean ± SD (range)	11.9 ± 0.4 (10–13)	11.9 ± 0.5 (10–13)
Medical or related profession of fathers (%)	2.4	1.5
Medical or related profession of mothers (%)	3.6	3.5
Recent illness (last month) (%)	33.9	38.6
Recent drug consumption (last month) (%)	37.2	29.6
Presence of medicines stored at home (%)	63.0	49.0*

Comparison between groups: *P < 0.05.

$P < 0.05$). The control group showed an increase in right answers regarding the need to avoid drug consumption during the common cold, but its perception as a non-serious condition was less frequent (from 62.2% to 46.4%;

$P < 0.05$). The concept of ORS was best known after the intervention (from 37% at basal to 53%), but it was not accompanied by an increase in knowledge regarding its preparation (from 19% to 21%).

Table 2

Short- and long-term results in each group, and statistical significance level between groups relative to long-term evaluations

Items	Intervention group			Control group			P
	Basal (n = 166)	Short- term (n = 166)	Long- term (n = 157)	Basal (n = 201)	Short- term (n = 201)	Long- term (n = 194)	
<i>Common cold</i>							
Is not a severe disease	47.9	47.0	55.8	62.2	55.3	46.4**	NS
Does not require drugs	31.5	61.4*	59.6*	24.1	31.5	37.2**	†
Injections do not cure	32.3	55.6*	33.1	39.1	41.8	30.7	NS
Cough is a defence mechanism	32.3	78.7*	63.5*	25.8	32.8	29.3	†
Do not use cough suppressants	17.8	65.0*	49.4*	12.6	20.6**	24.2**	†
<i>Diarrhoea</i>							
Is a defence mechanism	45.3	78.3*	58.8**	47.1	43.3	50.5	NS
Do not take antidiarrhoeals	33.7	53.4*	48.1*	36.1	38.3	33.5	††
Avoid dehydration	79.8	79.9	89.0**	82.7	79.2	86.5	NS
Knows ORS	38.7	79.8*	76.9*	37.0	45.7	53.6**	†
Knows how to prepare ORS	18.2	77.6*	65.6*	19.4	25.1	21.1	†
<i>Multivitamins</i>							
Are drugs	82.7	46.9*	52.9*	82.8	79.4	74.3**	†
Do not help us to study	57.0	92.7*	81.3*	66.3	68.9	66.3	††
Do not give us more energy	24.2	81.6*	50.6*	24.4	33.0	26.7	†
Do not make us grow stronger	27.4	80.7*	63.6*	21.2	29.1	33.2**	†
Present multivitamin consumption	43.9	25.3*	26.1*	36.5	33.3	34.2	NS
<i>Other items</i>							
Medicines promotional activity does not teach one to be healthy	25.3	79.3*	59.4*	21.5	30.5**	32.4**	†
Medicines are not always the best way to be healthy	45.1	79.6*	76.0*	41.7	47.2	43.8	†
Drugs are not always safe	71.5	83.5*	92.2*	61.7	68.6	68.4	†
To know which drugs we need to take, asking to the pharmacist is not enough	79.3	94.5*	91.0*	64.3	76.0	81.2	†

ORS, Oral rehydration salts. Items are presented as the right option. Short- and long-term results vs. baseline: * $P < 0.001$ and ** $P < 0.05$. Long-term results between groups: NS, nonsignificant; † $P < 0.001$ and †† $P < 0.01$.

Long term, most of the intervention groups' knowledge was still significantly better than the basal knowledge and that of the control group.

The intervention group showed an increase in recognition of false benefits of multivitamins as well as a reduction in their perception as drugs, with a negative change in the frequency of right answers between basal and short-term measurements (from 82.7% to 46.9%; $P < 0.001$) and a slight recovery long term (from 46.9% to 53.2%). Additionally, in this group less consumption of multivitamin preparations was reported in the three measurements (43.9% basal; 25.3% short term; 25.6% long term; $P < 0.001$). The differences with the control group did not reach statistical significance.

Misconception risk reduction

A RR reduction in misconceptions about drugs was found short term. The intervention group was less predisposed to consume antidiarrhoeals (RR = 0.75, 95% CI 0.62, 0.92) or to use cough suppressants (0.44, 95% CI 0.35, 0.55) and other medicines for the common cold (0.56, 95% CI 0.45, 0.70). False benefits of multivitamin preparations were reduced in 73%. These reductions were similar long term (Table 3). Only the misconception about utility of injections in the common cold had a nonstatistically significant reduction of 4%.

Long-term changes in knowledge

The intervention group showed a slight decrease in knowledge long term, but it remained better than the

Table 3

Long-term relative risk reduction (RRR) in misconceptions about drug use

Misconceptions about drug use	Intervention group (n = 166)	Control group (n = 201)	RR	95% CI	RRR, %	P
<i>Common cold</i>						
Require drugs (%)	40.4	62.8	0.64	0.52, 0.80	36	<0.001
Injections to cure (%)	66.9	69.3	0.96	0.83, 1.12	4	NS
Require cough suppressants (%)	50.6	75.8	0.67	0.56, 0.80	33	<0.001
<i>Diarrhoea</i>						
Require take antidiarrhoeals (%)	51.9	66.5	0.78	0.65, 0.94	22	<0.01
<i>Multivitamins</i>						
Help us to study (%)	18.7	33.7	0.56	0.38, 0.82	44	<0.01
Give us more energy (%)	49.4	73.3	0.67	0.56, 0.81	33	<0.001
Make us grow stronger (%)	36.4	66.8	0.54	0.43, 0.69	46	<0.001
<i>Other items</i>						
Medicines promotional activity is educational (%)	40.6	67.6	0.60	0.49, 0.75	40	<0.001
Medicines are always the best way to be healthy (%)	24.0	56.3	0.43	0.31, 0.58	57	<0.001
Drugs are always safe (%)	7.8	31.6	0.25	0.14, 0.44	75	<0.001
To know which drugs we need to take, asking the pharmacist is enough (%)	9.0	18.8	0.48	0.27, 0.85	52	<0.01

control group. The worst negative changes were those regarding the energizing effects of multivitamins (−31.0%), the benefit of injections in the common cold (−22.5%), the perception of diarrhoea as a defensive mechanism (−19.5%) and the perception of medicines promotional activities as educational (−19.9%) (Table 2).

Discussion

The basal findings of this study suggest that misconceptions about medicines are frequent in young populations (i.e. adolescents and secondary school students) and that they trust in the usefulness of medicine consumption in keeping healthy. The educational intervention improved the students' knowledge of some aspects of rational drug use and decreased the frequency of misconceptions. Additionally, most of these results remained 1 year after intervention, a finding that opens the possibility of retaining the new knowledge during the time if reinforcement activities are performed.

Previous educational interventions to improve medicines use in the general population have been poorly documented [9] and most of them have shown variations in their results [10]. Experimental studies to evaluate educational interventions in adolescents had focused programmes on reducing or preventing the use of addictive substances [6–8, 18]. The results of the present

study could be useful in providing a wider perception about the adolescents' attitudes towards medicines and the effectiveness of this kind of intervention.

The intervention improved long-term knowledge about ORS use and preparation and lowered the predisposition to consume antidiarrhoeals. This is important, because antidiarrhoeals are not recommended and have a poor risk–benefit relation [19], but are frequently consumed in developing countries [1, 2, 11]. Something similar happened concerning common-cold drugs, whose efficacy is doubtful [20].

Interestingly, a change was found in the perception of multivitamins in the intervention group. While these products 'lost' their growing and energizing properties after the intervention, the students did not think that vitamins were drugs and their consumption was reduced. An inverse situation was found long term. This change could be related to conflicting information from promotional activity on radio and TV.

Although the main outcome of this trial was learning (knowledge or acquired skills), the reduction in consumption of multivitamin preparations and RR reduction in other misconceptions suggest that this kind of educational intervention is useful to translate knowledge into real practice, as other authors have pointed out [18, 21]. To confirm this possibility, future researches focused on behaviour and real practice are needed.

The main characteristics and the basal knowledge of both participating secondary schools were similar. An information bias due to the parents' profession was unlikely. The absence of common activities between the two secondary schools decreased the chance of contamination bias.

The educational intervention was short (1 day) but highly efficient, probably because the main messages and their transmission to students were simple, easy and understandable, without the use of complex words. Moreover, the main messages were repeated in the working groups. This intervention used a marketing strategy named 'demarketing' (activities to promote a reduction in consumption of a specific product, e.g. campaigns to reduce smoking) and applied some marketing rules proposed to elaborate messages addressed to the adolescent public [14–16]. To our knowledge, this kind of strategy has not previously been used in educational interventions concerning rational drug use in general populations, and is obviously not easy to follow in programmes to reduce addictive substance abuse because these do not have promotional messages in mass media. The observed effect could be related to the adolescent predisposition to assimilate concrete messages concerning their personal status, health and future, as other studies have suggested [18].

One of the results of the present study was that the most affected knowledge long term was related to the most common promotional topics; conversely, uncommon topics or those included in public health promotion (such as dehydration in diarrhoeal disease) showed little change. This finding confirms that marketing of drugs in the mass media has an effect on drug perception by younger populations.

Promotion of medicines had been criticised both for its exaggeration of benefits [22] and minimization of risks [23] to induce consumption. Frequently, aspects such as 'have better health', 'be active', 'do not be sick', 'reach better quality of life' are used by the pharmaceutical industry in their promotional messages [4, 11]. These advertisements also aim at convincing consumers that drugs are an easy escape route from certain difficult social situations and unacceptable life styles.

The present study suggests a possible effect of medicines promotional activity on adolescent girls. Previous studies have shown that misconceptions could increase inappropriate self-medication, previously reported as 51% in Ecuador [24]. This should be taken into account by regulatory drug authorities in order to analyse promotional messages carefully before approval for broadcasting.

The study population included only females, but

results could be valid for male adolescents also. This is feasible because no gender differences were found in other studies of patterns of addictive substances use in high-school students [25]. Nevertheless, since some different perceptions about drugs could be related to gender and age, administration dependence of high-school and socio-economic circumstances, these aspects should be investigated in future research focusing on the main measurements in knowledge, attitudes and practices in self healthcare.

The present study has shown that it is possible to modify favourably the knowledge of appropriate use of medicines in a teenage population, and that this modification of knowledge and attitudes lasts at least 1 year. Continuous reinforcing interventions throughout primary and secondary schools curricula would probably allow improved and long-lasting effects, and could help to fill the gap in education of the general population in order to gain informed consumers capable of dealing with a highly medicalized society.

Competing interests: None declared.

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